

BIOLOGY & CAVE LIFE

Mammoth Cave National Park's 52,700 acres constitute one of the greatest protectors of biological diversity in Kentucky. The surface contains animals typical of an eastern hardwood forest. Larger animals include white-tailed deer, fox, raccoon, opossum, woodchuck, beaver, rabbit and squirrel. Smaller animals, such as bats, mice and chipmunks, also abound. Many reptiles and amphibians find protection in the park too. Birds such as mourning doves, whippoorwills, owls, hawks, woodpeckers, and warblers fly through Mammoth Cave's forests. Wild turkeys reintroduced in 1983 are now regularly seen by visitors.

Varied Forests

While most of the park consists of second-growth woodland, a number of unique communities of plants -- hemlocks and other northern plants growing in cool moist ravines, wetlands, and open barrens with prairie vegetation -- contribute much to the variety in plant life and harbor many of the park's rare species. Currently, botanists are updating the park plant list. So far, 872 species of flowering plants have been confirmed, and the list is still growing. Of these species, 21 are currently listed as endangered, threatened or of special concern. Active management, including prescribed burning, may be needed in order to protect some habitats in the park.

Teeming Rivers

The Green River, which meanders through the park, supports an unusual diversity of fish, including five species that have not been found anywhere else in the world, and three species of cavefish. Another group of aquatic animals, fresh-

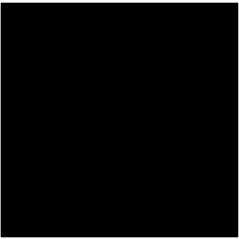
water mussels, survive in the sand and gravel of the Green River. Over 50 species of mussels, including three on the endangered species list, live in the park. Aquatic animals in the river play an important role in providing nourishment for other animals -- in the cave, in the river, and on the land.

Things that go Bump in the Dark

On first glance, in walking into Mammoth Cave, the dark and quiet passageways may appear nearly devoid of life. But first impressions can be deceiving, and surprisingly, biologists have discovered over 200 species of animals in Mammoth Cave! Animals in the cave include everything from surface animals that have accidentally stumbled or tumbled into the cave -- like raccoons and bullfrogs -- to 42 species of troglobites, animals adapted exclusively to life in the darkness. One of Mammoth Cave's claims to fame, besides its length and wealth of human history, is its biological variety. The diversity of cave animals in the Mammoth Cave area rivals the richness of any caveland region in the world. To a biologist, a cave is a wildlife sanctuary -- a retreat for animals so specialized in structure and habit that they cannot endure conditions on the surface. To understand the survival techniques of cave animals, we need to first take a closer look at three environmental factors governing Mammoth Cave.

First of all, the cave world does not change as rapidly as our sunlit world; however, change does occur. The cave has its own cycles and rhythms of life. The temperature of the cave varies due to air movement near the entrances, the location (on ridges or in valleys), and the temperature of water entering the cave. In a sense, the cave has its own weather system. Wind is created by temperature differences between the entrance and interior passageways. This causes a "chimney effect," resulting in a wind chill factor underground. The chimney effect can also produce "rain" inside the cave by altering the dewpoint. The final contributor to cave weather is the barometric pressure. Barometric changes affect air movement, humidity levels and dew points. Subtle weather changes in the cave make it possible for a perceptive caver to discern outside weather conditions,





even though he or she may be hundreds of feet below the surface.

Secondly, Mammoth Cave is intricately tied to the outside world. The cave is different from our world, but the survival of cave life depends on the surface. Plants, through photosynthesis and through their own decay, release carbon dioxide that combines with water in the air and in the soil, to form weak carbonic acid that carves the cave. In addition, plants provide food and energy for underground animals. No matter how organic material enters the cave, the web of the cave begins with the sun.

Thirdly, the lack of light produces stress in caves by limiting the availability of food. Therefore, cave animals must make behavioral, physiologi-

If all the beasts were gone, many would die of a great loneliness of spirit. For whatever happens to the beasts, soon happens to man. All things are connected.

Chief Seattle

cal, and morphological adaptations to survive. Some animals, called troglloxenes (or cave visitors), regularly visit or hibernate in caves but customarily leave caves. By collecting food on the surface and then returning to caves, troglloxenes play an important role in providing food for cave animals that never venture outside. Bats, cave crickets, and pack rats are well-known troglloxenes.

No Vampires Need Apply

Although Mammoth Cave is not currently used by large numbers of bats, twelve species, including two endangered species, live here. As insect-eaters and plant pollinators, bats may be among the most beneficial animals to people and other living things. By consuming huge numbers of insects, bats work as a "natural insecticide," controlling crop pests and insects that may spread disease. Little brown bats, one of the common species in Mammoth Cave, can eat 600 mosquitoes in an hour. In addition, many cultivated plants that we enjoy -- including avocados, dates, peaches, bananas, and

cashews -- depend on bats for pollination. Despite their value, many species of bats are needlessly threatened -- by direct killing, by vandalism, by disturbance to hibernating and maternity colonies, by the use of pesticides, and by habitat destruction. Consequently, bat populations in the United States and throughout the world have been declining dramatically.

Hopping, Scuttling, Swimming

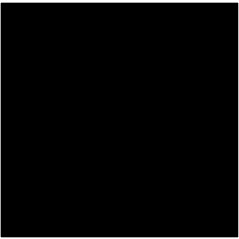
When you visit Mammoth Cave, you're far more likely to see crickets than bats. Crickets, actually a kind of grasshopper, are troglloxenes too. They spend much of their life in the cave but depend on night-time forays on the surface to gather food. Because Mammoth Cave lacks large bat populations, crickets are extremely important in delivering energy, in the form of droppings, eggs, and carcasses, to other animals in the cave.

Another group of cave animals, the trogllophiles (or cave lovers), have evolved a step closer to cave dependency than the troglloxenes. Trogllophiles can survive for their entire lifetime in caves, but they can also live exclusively on the surface, where they select cool dark places reminiscent of the cave environment. Trogllophiles include crayfish, springfish, salamanders, and spiders.

Trogllobites, the group of cave animals most highly adapted to cave life, cannot survive outside caves. Many, including eyeless fish and crayfish, illustrate creative adaptations to their environment. With no need for camouflage or protection from the sun, many of these animals have lost pigmentation and are white. Some have no eyes. Most have developed other highly sensitive sensory organs to detect predators and prey. Because food in caves is scarce, full-time cave dwellers tend to be smaller, with lower metabolism and longer lifespans than their surface counterparts.

In Danger ...

The lifestyles of all cave animals highlight the fragility and interconnectedness of the surface and the cave environments. Ultimately, the energy that feeds cave animals comes from the surface. In addition, land-use practices outside



the park impact water quality and the lifeforms in the cave. Even visitors entering the cave impact the underground world. Lighting, trail construction, building unnatural entrances, and noise from cave tours, affect the inhabitants of this sensitive and fascinating underground world.